DRAWINGS

A Replacement Sheet for Fig. 1 is submitted with proposed changes highlighted in yellow to remedy the duplicate use of reference characters 19 and 40 in the Specification. Corresponding amendments have been made to the Specification.

REMARKS

The Examiner's thoughtful attention to this application is sincerely appreciated.

Reconsideration of the objections set forth in the Office Action of February 8, 2005, is respectfully requested in view of the foregoing amendments and following remarks.

Drawings

Applicant has submitted a proposed revised Fig. 1 and has amended the Specification to remedy the duplicate use of reference characters "40" and "19", and to remedy other typographical errors in the Specification.

Information Disclosure Statement

An information disclosure statement is submitted herewith along with a copy of Applicant's earlier issued U.S. Patent No. 5,284,250 that discloses apparatus similar to that of Fig. 3 in the instant application.

Section 102

As noted at p. 1 and p. 15 of the Specification of the application, two long-existing problems associated with drilling for petroleum are:

1. The large amounts of water required to produce "primary" mud that is injected into the top of a drill pipe, and

2. The disposal of spent drilling mud.

Trucking water in to a drill site and trucking spent drilling mud away from the drill site is costly. In addition, spent drilling mud typically is expensive to dispose of because when the mud is moved from a drilling site to a landfill the mud is not "dry".

Applicant provides an improved process that:

1. Processes spent mud and produces

   a. Water, and

   b. Dry mud.

2. Uses the water to produce "primary" drilling mud that is substantially ***free of drill bit cuttings*** and that is directed into ***the top*** of a drill pipe in a drilling

rig.

The apparatus shown in Figs. 3 and 4 of the application are instrumental in Applicant's process. These apparatus:

1. Employ a ***stationary housing*** and a disk that ***rotates*** in the housing, and

2. Can separate drilling mud into **three or more** fractions. In particular, the "stacked" apparatus of Fig. 4 facilitates the separation of drilling mud into three or more fractions.

3. Can separate petroleum hydrocarbons from water.

4. Can produce a fraction that is substantially all water.

5. Can produce a fraction that is substantially all petroleum hydrocarbons.

6. Can produce a dry fraction.

In contrast, the deBoer reference (U.S. 2003/0217866) does not appear to:

1. Produce a dry fraction.

2. Produce water that is used at the drilling site to produce primary drilling mud

that is injected into the top of a drill pipe. Instead, the "base fluid" utilized by deBoer is used to reduce the density of spent drilling mud at the ***ocean floor*** to facilitate the travel of the mud through a "riser" from the ocean floor to the surface of the sea:

> *"The below-seabed charging line section 103 is used to insert a base fluid into the wellbore to mix with the upwardly returning drilling mud ...." Page 3, Paragraph 0047.*

> *"In accordance with a preferred embodiment of the present invention, when it is desired to dilute the rising drilling mud, a base fluid (typically, a light base fluid) is mixed with the drilling mud either at (or immediately above) the seabed or below the seabed." Page 3, Paragraph 0051.*

3. To produce more than two fractions. Centrifuges of the type shown in deBoer typically are only capable of a fluid-fluid or fluid-solid separation.

4. Suggest a mud processing system that utilizes apparatus of the type illustrated in Fig. 3 and 4 of the application. In a centrifuge, the housing ***rotates***. In the apparatus of Figs. 3 and 4, the housing is ***stationary*** and the ***disk inside the housing rotates***.

Applicant's U.S. Patent No. 5,284,250 does not address the production of dry material, does not disclose the "stacked" apparatus illustrated in Fig. 4 herein, and does

not address the methods discussed herein for reusing water at a drill site and for processing and disposing of spent drilling mud.

Applicant therefore respectfully submits that the invention as now set forth in the new Claims is not anticipated under 35 U.S.C. Section 102 or rendered obvious under 35 U.S.C. Section 103 by the references of record, whether taken singly or in combination.

Since the new proposed Claims are lengthy, Applicant has–to facilitate the Examiner's review--attached as Exhibit A a copy of the Claims with some of the more pertinent portions of the Claims bolded and with references to corresponding portions of the Specification set forth in the Claims.

If the Examiner finds merit in the foregoing remarks and amendments, it is believed the application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

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EXHIBIT A

Claims with Bolded Portions and References to Specification

Claim 2 (New): A method for drilling for petroleum, comprising the steps of

(a) erecting a derrick assembly on the ground;

(b) mounting a drill on said derrick assembly, said drill including a hollow drill pipe having an upper end and a lower end and a drill bit attached to the lower end;

(c) mounting a rotary assembly at said derrick assembly to provide motive power to rotate said drill bit in the ground to produce drill bit cuttings;

(d) mounting a drilling mud circulation system at said derrick assembly to **direct primary drilling mud into said upper end of said drill pipe**, down through said drill pipe, out the lower end of said drill pipe, and up through a hole in the ground to produce auxiliary drilling mud containing drill bit cuttings;

(e) providing a source of primary drilling mud for said circulation system, said mud including water and clay and substantially free of drill bit cuttings ***[Specification, p. 7, lines 8 to 14]***;

(f) providing a first particle separation apparatus including

(i) at least one stationary wall defining a stationary separation chamber,

(ii) a feed inlet orifice formed in said chamber,

(iii) at least one rotary distributor in said chamber including a rotating distribution disk including an upper surface,

(iv) a drive system for rotatably driving said rotary distributor to rotate said disk and said upper surface at a speed in the range of **500 RPM to 10,000 RPM** ***[Specification, p. 12, line 26]***,

(v) at least first and second outlets formed in said wall,

(vi) an open particle circulation space intermediate said disk system and said outlet and circumscribed by a portion of said wall, said outlet opening into said particle circulation space,

(vii) a charging system for charging auxiliary drilling mud containing drill bit cuttings through said orifice into said separation chamber toward said rotary distributor such that said auxiliary drilling mud, at least in part, impinges said upper surface, said rotary distributor providing the motive power to move

at least a portion of the auxiliary drilling mud outwardly over said upper surface and into said chamber away from said rotary distributor,

a first portion of said auxiliary drilling mud over said upper surface

and into said chamber in a primary continuous helical path of travel away from said rotary distributor and said orifice through said circulation space toward and into said outlet,

a second portion of the auxiliary drilling mud in a secondary recirculating helical path of travel away from said rotary distributor and said orifice through said circulation space toward said outlet and away from said outlet back toward said rotary distributor,

said auxiliary drilling mud including at least 50% by weight water;

(g) rotating said drill into the ground with said rotary assembly to form said hole in the ground and produce drill bit cuttings in said hole, said hole having a top and a side;

(h) circulating primary drilling mud with said mud circulation system along a path down into said upper end of said drill pipe, through said drill pipe, out said lower end of said drill pipe, up through said hole intermediate said drill pipe and said side of said hole, and out through said top of said hole, to produce said auxiliary drilling mud containing drill bit cuttings;

(i) operating said a drive system to rotate said upper surface at a speed in the range of **500 RPM to 10,000 RPM**;

(j) transporting to said charging system said auxiliary drilling mud, said charging system directing said auxiliary drilling mud through said inlet orifice into said stationary separation chamber toward said rotary distributor such that the material directed through said inlet orifice is at **least fifty percent by weight liquid** ***[Specification, p. 14, lines 15 to 18]*** and such that said auxiliary drilling mud, at least in part, impinges said rotating upper surface such that

(i) **first dry material** including clay passes outwardly from within said stationary wall **through said first outlet**, and

(ii) **second dry material** passes outwardly from within said stationary wall **through said second outlet** ***[Specification, p. 14, lines 19 to 29; p. 15, lines 1 to 3 and lines 16 to 28.]***

(k) transporting at least said **first dry material to a landfill**; and,

(l) depositing said first dry material in the landfill.

Claim 3 (New): A method for drilling for petroleum, comprising the steps of

(a) erecting a derrick assembly on the ground;

(b) mounting a drill on said derrick assembly, said drill including a hollow drill pipe having an upper end and a lower end and a drill bit attached to the lower end;

(c) mounting a rotary assembly at said derrick assembly to provide motive power to rotate said drill bit in the ground to produce drill bit cuttings;

(d) mounting a drilling mud circulation system at said derrick assembly to direct primary drilling mud into said upper end of said drill pipe, down through said drill pipe, out the lower end of said drill pipe, and up through a hole in the ground to produce auxiliary drilling mud containing drill bit cuttings;

(e) providing a source of said primary drilling mud for said circulation system, said mud including water and clay and substantially free of drill bit cuttings;

(f) providing a particle separation apparatus including

(i) a **first stationary wall** defining a **first stationary separation chamber**,

(ii) a feed inlet orifice formed in said chamber,

(iii) at least one rotary distributor including

a first end of a **hollow rotating shaft**, said first end positioned in said chamber, said rotating shaft also including a second end located outside said chamber, and

a first distribution disk mounted on said first end to rotate in said chamber simultaneously with said shaft and including an upper surface,

(iv) at least a first outlet formed in said wall,

(vi) an open first particle circulation space intermediate said disk and said outlet and circumscribed by a portion of said wall, said outlet opening into said particle circulation space,

(vii) a charging system for charging auxiliary drilling mud through said orifice into said first separation chamber toward said disk such that said auxiliary drilling mud, at least in part, impinges said upper surface, said rotating distribution disk providing the motive power to move

at least a portion of said auxiliary drilling mud outwardly over said upper surface and into said chamber away from said disc,

a first portion of the auxiliary drilling mud over said upper surface and into said chamber in a primary continuous helical path of travel away from said rotary disc and said orifice through said circulation space toward and into and through said outlet as **a dry fraction including clay**,

a second portion of the auxiliary drilling mud in a secondary recirculating helical path of travel away from said rotary distributor and said orifice through said circulation space toward said outlet and away from said outlet back toward said rotary distributor and into said first end of and **rotatably through** ***[Specification, p. 11, lines 24 to 27]*** said hollow rotary shaft,

(viii) a **second stationary wall** defining a **second stationary separation chamber**,

(ix) at least a second rotary distributor including

said second end of said hollow rotating shaft positioned in said second chamber, and

a second distribution disk mounted on said second end to rotate in said second chamber simultaneously with said second end and including an upper surface,

(x) at least a second outlet formed in said second wall,

(xi) an open second particle circulation space intermediate said second disk and said second outlet and circumscribed by a portion of said second wall, said second end of said hollow rotary shaft opening into said second particle circulation space such that said second portion of said auxiliary drilling mud **rotatably exits** from said second end, travels toward said second disk such that said second portion, at least in part, impinges said upper surface of said second disk, said second rotating disk providing the motive power to move

at least a portion of the auxiliary drilling mud outwardly over said upper surface of said second disk and into said second chamber away from said second disk,

a primary portion of said second portion over said upper surface

of said second disk and into said second chamber in a primary continuous helical path of travel away from said second disk away from said second end through said second circulation space toward and into and through said second outlet as a liquid portion including water,

a secondary portion of said second portion in a secondary recirculating helical path of travel away from said second disk and said second end through said second circulation space toward said second outlet and then away from said second outlet back toward said second end of said rotary shaft,

(xii) a drive system to rotatably turn said hollow rotary shaft at a speed in the range of 500 RPM to 10,000 RPM, and

(xiii) a **return system to direct said liquid portion into said source of said primary drilling mud before said primary drilling mud is directed into said upper end of said drill pipe** ***[Specification, p. 5, lines 20 to 22]***;

(h) rotating said drill into the ground with said rotary assembly to form said hole in the ground and produce drill bit cuttings in said hole, said hole having a top and a side;

(i) operating said drilling mud circulation system and said return system to

direct said liquid portion into said primary drill mud before said primary drilling mud is directed into said upper end of said drill pipe, and

circulate drilling mud with said mud circulation system along a path down into said upper end of said drill pipe, through said drill pipe, out said lower end of said drill pipe, up through said hole intermediate said drill pipe and said side of said hole, and out through said top of said hole, to produce said auxiliary drilling mud containing drill bit cuttings;

(j) operating said drive system to rotate said upper surface of said first distribution disk and of said second distribution disk at a speed in the range of 500 RPM to 10,000 RPM;

(k) transporting to said charging system said auxiliary drilling mud, said charging system directing said auxiliary drilling mud through said inlet orifice into said first stationary separation chamber toward said **first distribution disk** such that the

material directed through said inlet orifice is at least fifty percent by weight liquid and such that said auxiliary drilling mud, at least in part, impinges said rotating upper surface of said first distribution disk such that

(i) first dry material including clay passes outwardly from within said stationary wall into and through said first outlet,

(ii) second dry material passes outwardly from within said stationary wall into and through said second outlet,

(iii) said second portion rotatably travels into said first end of said hollow rotary shaft, through said hollow shaft, and out said second end of said hollow rotary shaft into said second separation chamber, and

(iv) said secondary portion of said second portion travels into and through said second outlet as a liquid portion including water;

(l) operating said **return system to direct said liquid portion to said source of said primary drilling mud before said primary drilling mud is directed into said upper end of said drill pipe**;

(m) transporting at least said first **dry material to a landfill**; and,

(n) depositing said first dry material in the landfill.

Claim 4 (New): The method of Claim 3 wherein said liquid portion is substantially all water.

Claim 5 (New): The method of Claim 3 wherein said circulation spaces are toroidal-shaped.

Claim 6 (New): The method of Claim 2 wherein said circulation space is toroidal-shaped.

Claim 7 (New): The method of Claim 3 wherein said liquid portion is substantially all water.

Claim 8 (New): A method for drilling for petroleum, comprising the steps of

(a) erecting a derrick assembly on the ground;

(b) mounting a drill on said derrick assembly, said drill including a hollow drill pipe having an upper end and a lower end and a drill bit attached to the lower end;

(c) mounting a rotary assembly at said derrick assembly to provide motive power to rotate said drill bit in the ground to produce drill bit cuttings;

(d) mounting a drilling mud circulation system at said derrick assembly to direct primary drilling mud into said upper end of said drill pipe, down through said drill pipe, out the lower end of said drill pipe, and up through a hole in the ground to produce auxiliary drilling mud containing drill bit cuttings;

(e) providing a source of said primary drilling mud for said circulation system, said mud substantially free of drill bit cuttings and including water, clay **and at least one petroleum hydrocarbon** ***[Specification, p. 14, line 13]***;

(f) providing a particle separation apparatus including

(i) a **first stationary wall** defining a **first stationary separation chamber**,

(ii) a feed inlet orifice formed in said chamber,

(iii) at least one rotary distributor including

a first end of a **hollow rotating shaft**, said first end positioned in said chamber, said rotating shaft also including a second end located outside said chamber, and

a first distribution disk mounted on said first end to rotate in said chamber simultaneously with said shaft and including an upper surface,

(iv) at least a first outlet formed in said wall,

(vi) an open first particle circulation space intermediate said disk and said outlet and circumscribed by a portion of said wall, said outlet opening into said particle circulation space,

(vii) a charging system for charging auxiliary drilling mud through said orifice into said first separation chamber toward said disk such that said auxiliary drilling mud, at least in part, impinges said upper surface, said rotating distribution disk providing the motive power to move

at least a portion of said auxiliary drilling mud outwardly over said upper surface and into said chamber away from said disc,

a first portion of the auxiliary drilling mud over said upper surface and into said chamber in a primary continuous helical path of travel away from said rotary disc and said orifice through said circulation space toward and into and through said outlet as **a dry fraction**

including clay,

a second portion of the auxiliary drilling mud in a secondary recirculating helical path of travel away from said rotary distributor and said orifice through said circulation space toward said outlet and away from said outlet back toward said rotary distributor and into said first end of and **rotatably through** said hollow rotary shaft,

(viii) a **second stationary wall** defining a **second stationary separation chamber**,

(ix) at least a second rotary distributor including

said second end of said hollow rotating shaft positioned in said second chamber, and

a second distribution disk mounted on said second end to rotate in said second chamber simultaneously with said second end and including an upper surface,

(x) at least a second and third outlets formed in said second wall,

(xi) an open second particle circulation space intermediate said second disk and said second outlet and circumscribed by a portion of said second wall, said second end of said hollow rotary shaft opening into said second particle circulation space such that said second portion of said auxiliary drilling mud **rotatably exits** from said second end, travels toward said second disk such that said second portion, at least in part, impinges said upper surface of said second disk, said second rotating disk providing the motive power to move

at least a portion of the auxiliary drilling mud outwardly over said upper surface of said second disk and into said second chamber away from said second disk,

a primary portion of said second portion into said second chamber in a primary helical path of travel away from said second disk and away from said second end through said second circulation space toward and into and through said second outlet as a first liquid portion including a portion of said water,

a secondary portion of said second portion in a secondary

recirculating helical path of travel away from said second disk and said second end through said second circulation space toward said second outlet and then away from said second outlet back toward said second end of said rotary shaft,

a tertiary portion of said second portion into said second chamber in a primary helical path of travel away from said second disk and away from said second end through said second circulation space toward and into and through said third outlet as a second liquid portion including a portion of said petroleum hydrocarbon,

(xii) a drive system to rotatably turn said hollow rotary shaft at a speed in the range of 500 RPM to 10,000 RPM, and

(xiii) a **return system to direct said liquid portion into said source of said primary drilling mud before said primary drilling mud is directed into said upper end of said drill pipe**;

(h) rotating said drill into the ground with said rotary assembly to form said hole in the ground and produce drill bit cuttings in said hole, said hole having a top and a side;

(i) operating said drilling mud circulation system and said return system to

direct said liquid portion into said primary drill mud before said primary drilling mud is directed into said upper end of said drill pipe, and

circulate drilling mud with said mud circulation system along a path down into said upper end of said drill pipe, through said drill pipe, out said lower end of said drill pipe, up through said hole intermediate said drill pipe and said side of said hole, and out through said top of said hole, to produce said auxiliary drilling mud containing drill bit cuttings;

(j) operating said drive system to rotate said upper surface of said first distribution disk and of said second distribution disk at a speed in the range of 500 RPM to 10,000 RPM;

(k) transporting to said charging system said auxiliary drilling mud, said charging system directing said auxiliary drilling mud through said inlet orifice into said first stationary separation chamber toward said **first distribution disk** such that the material directed through said inlet orifice is at least fifty percent by weight liquid and such that said auxiliary drilling mud, at least in part, impinges said rotating upper

surface of said first distribution disk such that

(i) first dry material including clay passes outwardly from within said stationary wall into and through said first outlet,

(ii) second dry material passes outwardly from within said stationary wall into and through said second outlet,

(iii) said second portion rotatably travels into said first end of said hollow rotary shaft, through said hollow shaft, and out said second end of said hollow rotary shaft into said second separation chamber,

(iv) said secondary portion of said second portion travels into and through said second outlet as a first liquid portion including water, and

(v) said **tertiary portion** of said second portion travels into and through said third outlet as **a second liquid portion including petroleum hydrocarbon** ***[Specification, p. 15, lines 11 to 15]***;

(l) operating said **return system to direct said first liquid portion to said source of said primary drilling mud before said primary drilling mud is directed into said upper end of said drill pipe**;

(m) transporting at least said first **dry material to a landfill**; and,

(n) depositing said first dry material in the landfill.

Claim 9 (New): The method of Claim 8 wherein said first liquid portion is substantially all water and said second liquid portion is substantially all petroleum hydrocarbon.

Claim 10 (New): The method of Claim 5 wherein said circulation spaces each have a conical base with a side at an angle (A) from the vertical and with a height (F) wherein the ratio of said angle (A) to said height (F) is in the range of 2:1 to 12:1. ***[Specification, p. 12, lines 18 to 20]***

Claim 11 (New): The method of Claim 6 wherein said circulation space has a conical base with a side at an angle (A) from the vertical and with a height (F) wherein the ratio of said

angle (A) to said height (F) is in the range of 2:1 to 12:1.

Claim 12 (New): The method of Claim 11 wherein said circulation space has a cylindrical portion with a side having a height (B) that is less than about four times the diameter (C) of said cylindrical portion. ***[Specification, p. 12, lines 23, 24]***

Claim 13 (New): The method of Claim 10 wherein said circulation spaces each have a cylindrical portion with a side having a height (B) that is less than about four times the diameter (C) of said cylindrical portion.

Claim 14 (New): The method of claim 12 wherein said particle separation apparatus is shaped and dimension to permit one hundred to two-hundred and fifty gallons per minute of said auxiliary drilling mud to be processed by said particle separation apparatus. ***[Specification, p. 11, lines 13 to 18]***

Claim 15 (New): The method of Claim 13 wherein said particle separation apparatus is shaped and dimensioned to permit one hundred to two-hundred and fifty gallons per minute of said auxiliary drilling mud to be processed by said particle separation apparatus.